

place depends on the presence of cultures of opposite mating type and the action of a chemical substance which induces copulating processes. This substance acts at a distance, and the result of this action could be observed even in a solid nutrient medium between separated colonies of yeast cells of opposite mating type.

No less fascinating than the chapter on cytology is that on "Yeast genetics," written by the same authors. The rapid vegetative growth of yeast in cultures and the possibility of isolating single cells or spores with the help of micro-manipulators and of carrying out artificial hybridization experiments offer the geneticist many advantages he cannot find in other organisms. Thus it is understandable that, from a genetic point of view, yeast is one of the most thoroughly investigated of microorganisms. We know a large number of individual genes of which those inducing chemical specificity of action are of great theoretical and practical importance; on the basis of linkage of these genes, chromosome maps have been constructed; and the existence of inbreeding degeneration, hybrid vigor, and mutations have been demonstrated. But the most interesting and presently most active field of research is that of cytoplasmic inheritance, whose far-reaching implications in biological theory and even in medicine, especially in cancer research, have not yet been fully realized.

The "Aspects of chemical composition of yeasts" are expertly covered by A. A. Eddy, while "Yeast growth" is ably dealt with by E. O. Morris from both the chemical and physiological point of view. Until recently it has been a common assumption that yeasts are unable to assimilate atmospheric nitrogen, but now we have conclusive evidence that certain strains of *Rhodotorula* and at least one strain of *Saccharomyces*, when grown in a nitrogen-free medium but in an atmosphere containing isotopic nitrogen, are able to convert the latter into organic compounds of their cell substance. However, if these facts are considered only as of "mainly academic interest," as the author indicates, a vigorous objection seems to be in order. In a world so short of protein and with yeast promising to play an ever-increasing part in protein supply for human beings and animals, the fact that certain yeast strains should be able to "fix" nitrogen from the air appears to be not only of great theoretical but of even greater practical significance. There is no reason why scientists should not be able to discover, or by way of induced mutations be able to "breed," organisms that will have a much greater nitrogen-fixing ability than those presently under consideration.

Very readable and illuminating are

the contributions on "Fermentation and respiration," by F. F. Nord and S. Weiss; on "Synthesis and degradation of carbohydrates," by W. E. Trevelyan; on "Nitrogen metabolism," by G. Harris; on "Yeast technology," by Magnus Pyke; on "Pathogenic yeasts," by C. G. Ainsworth; on "Food spoilage," by M. Ingram; and on "Flocculation," by H. E. Jansen.

In summarizing I must say that this work, to which scientists from England, Holland, Denmark, and the United States have made such eminent contributions, is a model of international scientific cooperation and, thanks to the painstaking efforts of its editor, also of conciseness and unity of presentation. In both text and appearance it does honor to the publisher; it should be recommended as a first-class scientific standard work to all who take a practical and theoretical interest in the agent of man's oldest industry—fermentation.

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**The Effects of Atomic Radiation on Oceanography and Fisheries.** Report of the Committee on Effects of Atomic Radiation on Oceanography and Fisheries of the National Academy of Sciences, Study of the Biological Effects of Atomic Radiation. Publication No. 551. National Academy of Sciences-National Research Council, Washington, D.C., 1957. vii + 137 pp. \$2.

The material presented in this volume is much wider in scope and interest than the title suggests. This comment should not be taken as meaning that the members of the Academy committee have evaded the issue presented to them. The issue of the biological effects of radiation is one that confronts all persons and governments, and the seeming absence of authoritative information makes for the prevalence of contradictory opinions. While the gaps in knowledge are freely indicated in this report, the careful collation of relevant information enables the reader to learn that considerable and careful attention has been given to the problems which the use of atomic phenomena raises.

In addition to an introduction on the importance of the ocean as a receptacle for radioactive materials, there are 13 chapters, dealing with properties of atomic wastes, natural radiations received by organisms, disposal and dispersal of radioactive elements, effects of ecological relationships on transport and dispersal, effects of radiation on aquatic organisms, and isotopic techniques in chemical and physical oceanography. Although each chapter is self-contained, there is

extremely little repetition, and the freshness in approach provides much stimulus to scientific thought. Despite the bias of the title towards the effects of atomic radiation, many fundamental fisheries and oceanographical problems are brought forward and receive illuminating attention.

The most serious type of hazard likely to arise from the addition of radioactive wastes to the sea is that following the concentration of wastes by organisms used as human food. The increasing use of the sea as a source of food for the rapidly expanding world population enhances the value of knowledge on this matter. As both the qualitative and quantitative natures of food chains differ in the various parts of the world, local studies are necessary. The information arising from such studies is indispensable to programs of proper fisheries management, and this interrelationship once more emphasizes the importance to fisheries science of a close synthesis with oceanographical knowledge. Similarly, the problems of radioactive disposal demand from oceanography a knowledge of currents, wind effects, sedimentation processes, and so forth—all matters of theoretical and applied importance in their own right but matters which ask for more urgent attention in the stress of the present age.

These questions and many others are critically considered throughout the report, and ingenious methods are suggested for their study. The collection of these stimulating and authoritative articles together in one volume is especially to be commended, as such reports are often buried in special publications issued in temporary form. It is hoped that the statement in the foreword that the study is a continuing one means that further volumes will appear.

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**Colorimetric Determination of Non-metals.** David F. Boltz, Ed. Interscience, New York, 1958. xii + 372 pp. Illus. \$8.50.

This book is volume VIII of a series of monographs on chemical analysis. As such, it complements volume III, Sandell's *Colorimetric Determination of Traces of Metals*.

Under the editorship of David F. Boltz, 14 authors, including Boltz, have cooperated in writing the 11 chapters. The first of these chapters covers briefly the principles and practices of colorimetric and related photometric methods. The other ten cover methods believed to

be most suitable for the following elements (or certain of their compounds): phosphorus, silicon, nitrogen, chlorine, bromine, iodine, fluorine, sulfur, tellurium and selenium, and boron. In general, following an introduction, each chapter covers separation, methods of determination, and important specific applications.

The list of supporting literature cited includes 718 references. A chemist informed about the literature would note that only two of the references cited appeared as late as 1957 and only six in 1956, although the book did not appear until well into 1958. The following are possible explanations for this small number of late citations: (i) there has been no more recent work; (ii) if there has been, the methods have not been sufficiently tested to justify inclusion in the volume; and (iii) the inevitable time lag in publication prevented inclusion of late work. In evaluating the up-to-dateness, of course, an experienced worker will rely on the date of the latest references cited rather than on the date of the copyright.

Three notable nonmetals not included are carbon, hydrogen, and oxygen. I would have welcomed chapters on these important elements, especially on hydrogen ions and simple inorganic compounds such as water, carbon monoxide, and carbon dioxide. Obviously, the wealth of organic compounds susceptible to colorimetric measurement could not be included.

This book is a valuable reference compilation for the elements covered and no doubt will be often cited, as Sandell's companion volume has been. The methods are carefully selected and concisely stated. Meticulous editing and proof-reading have reduced inconsistencies and typographical errors to a minimum.

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**Handbuch der Physik.** vol. XXXIV, *Corpuscles and Radiation in Matter*, II. S. Flügge, Ed. Springer, Berlin, 1958. viii + 316 pp. Dm. 78.

This new volume of the *Handbuch der Physik* contains six more or less independent articles pertaining to the processes involved in the slowing down and disappearance of particles and radiation in matter. The emphasis throughout is on the experimental results; theory is introduced only in order to show the agreement between theory and experiment.

The first article, written by R. Kollath, is in two parts—the first on slow electrons and the second on slow ions. The discussion of electrons starts with a

careful review of the experimental determinations, both as to methods and as to results. The comparison with theory that follows is restricted to angular distributions, these being the most sensitive to test. The part concerning the passage of slow ions through gases starts with a discussion of sources and proceeds to the experiments. The results are indicated in some detail, with major emphasis on the role of exchange and resonances. A short paragraph about negatively and multiply charged ions concludes the article.

The second article, written by R. D. Birkhoff, treats the passage of fast electrons through matter. Summaries of the theories for various types of events are given and compared with the results of experiment. Free electron-electron and positron-electron collisions are discussed. This is followed by a section on stopping power for electrons, including density effect and Cerenkov radiation. Considerable space is given to a treatment of collisions with the conduction plasma. The rest of the article treats the statistical behavior of electrons. Energy loss and straggling are well treated. This is followed by a thorough discussion of the theory and results in multiple scattering. The results of single nuclear scattering calculations by several authors are collected in convenient form. Finally, the effects of thick targets and associated range relations are presented.

Positronium is the subject of the third article, written by L. Simons. The theoretical results are presented in the first part. There follows a more or less historical discussion of the experiments on positronium, including quenching, spectra, angular correlations, and solid state aspects, which does very well in introducing the reader to all but the most recent work.

The fourth article, written by E. Merzbacher and H. W. Lewis, is on x-ray production and ionization by heavy ions. It starts with a theoretical discussion of some length. Experimental results are given and compared to the theory, particularly with respect to ionization. The article concludes with a short section on continuous radiation.

Energy loss by heavy particles in the energy range below 10 Mev is treated by W. Whaling in the fifth article. The results in this region are mostly experimental. A very useful collection of results has been assembled. Most of the values given are for protons and alpha particles, but a few results for heavier ions are included. I regret that the article does not include results at higher energies, which occupy a position of major interest today.

In the final article, R. D. Evans gives a comprehensive treatment of the Compton effect. Starting with a historical background, he discusses the early experi-

ments and their later improved versions. The treatment is such as to point up the similarities and differences of the classical and quantum treatments. Formulas, graphs, and tables for various cross sections are given, including some energy distributions useful in instrumentation. Following this is a summary of absorption data for photons. The effect of electron binding on the photon scattering is discussed, including Rayleigh scattering. Finally, there is a section on Compton scattering by magnetically oriented electrons, with an indication of the possibility for detecting circular polarization.

Two general items disturbed me slightly. The termination date of the bibliographies was not always clear, and some of the graphs appear to be only of qualitative value. The articles do, however, supply good introductions to the various topics.

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**Anatomist at Large.** An autobiography and selected essays. George W. Corner. Basic Books, New York, 1958. v + 215 pp. \$4.

George Corner presents a brief but poignant glimpse of his personal and professional life as introduction to ten selected essays and addresses from his pen. The autobiographical matter tells of family, and of boyhood and education in Baltimore. It tells of the young doctor's decision to follow a laboratory career and of the felicitous associations and circumstances accompanying a productive life as a distinguished leader in investigations of the sex hormones. One could wish for more than 64 pages of autobiography in this book of 215 pages. Readers would have welcomed inclusion of a photograph of the author.

Arranged in chronological sequence, from student days to retirement, the several essays and addresses suggest a measure of the wisdom and humanity of the author. Three essays, reflecting his scholarly interest in medical history, are followed by a look at the scientist in his workshop. In this account of his "quest for a hormone" one may discern the undercurrent of subdued excitement, the sense of urgency, and the aura of imminent discovery that pervaded his laboratory. Such an atmosphere is heady wine, and it drew able and dedicated investigators to his side from across the world.

The addresses offer sage advice and reflective comment on subjects ranging from the attributes of a good physician to a contemplation of the "incomprehensibles" that the thoughtful scientist cannot evade. Finally, there is consideration